Applying Movie and Multimedia to the Inclusive Learning and Teaching in Germany: Problems and Solutions

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Abstract. The focus of the study is on the didactic and methodological implementation of inclusive education through multimedia with a focus on film. The data was provided by teachers using media in their lessons incorporating inclusive forms of learning. The whole project consisted of phase I and II. The educational homepage "Planet School" by the public broadcaster WDR was used as an example. For this purpose, different types of schools worked with "Planet School" in inclusive education. Using guidelines based on the findings of the first phase, the public broadcasting organization WDR made four films for use in geography lessons, as well as additional media and materials for inclusive education. The focus of phase II is on the didactic and methodological implementation of inclusive education using film as a medium. The question is examined: How successfully can pupils learn using films and materials designed using inclusion guidelines? The existing films and materials were tested by eight inclusive classes. Based on these tests, an understanding of how media should be designed to acquire knowledge in inclusive education was achieved. The results of data analysis underline the relative satisfaction of students and teachers. The systematic comparison of the different data sources was made along deductively and inductively developed categories. These example of a personalised learning with a blended learning platform show not only how media based education can enhance everybody's ability to learn, but also that special education can be a key driver in proliferating media related learning.

Keywords: E-inclusion · Blended learning · Broadcasters · Inclusive education · Inclusive multimedia learning materials

1 Introduction

In view of the fact that nowadays, moving images are with us always and everywhere, our knowledge of the world can be seen both in and through them. "Pictures explain the world and influence our ethical and normative ideas. They are used for communication" [1]. For children and adolescents, images are not only moving pictures of reality. They are an essential means of self-expression. The presented study reveals the significance of image-based information and how it is used for blended learning in inclusive classrooms.

Comparative international studies, e.g. ICILS 2013 [2] show how social challenges, such as participation and handling heterogeneity at school, can be addressed through

media. The research presented here is part of a project (reported in [3]) with the overall aim of investigating the design and use of blended learning for inclusive education. The whole project consisted of phase I and II. The here described project is the second phase with a focus on the didactic and methodological implementation with a focus on movies.

The main focus was how individualized and personalized blended learning can succeed in inclusive education? Thereby, the research questions are: How does learning with movies and blended learning materials, designed according to the in phase I developed design guidelines succeed? How can students with different learning conditions use movies and learning materials?

This research project aims to show how inclusive education with these movies and learning materials can succeed and what influence different design elements (such as animations) have on learning.

2   State of the Art

In research on evidence-based design of learning materials for inclusive education, the question: "What characterizes good learning materials?" must first be clarified. If this is to be achieved, one should first define what effective teaching and learning involves. The most prominent international study on this issue is the study Visible Learning by John Hattie [4]. He ranked 138 influences that are related to learning outcomes from very positive effects to very negative effects. Hattie found that the average effect size of all the interventions was 0.40. Among the first positions in the ranking are the following factors:

1.   Teacher Clarity d = .75
2.   Feedback d = .73
3.   Teacher-student-relationships d = .72
4.   Meta-cognitive strategies d = .69
5.   Repeated reading programs d = .67
6.   Peer Tutoring d = .55
7.   Classroom Management d = .52 [4]

Evidence base educational research show that the differences in competences between western and eastern states can be explained by the schoolbooks and its related learning cultures [5]. That's the reason why in many countries learning resources have to be authorized through a scientific evaluation. Based on his research on the design of textbooks Wellenreuther derived the following consequences:

–   Emphasis on deeper understanding; different approaches,
–   Critical points, typical errors – little internalization of processes
–   Fewer topics, thinner books
–   More scope for explanations
–   Comprehensibility: step-by-step development of solutions
–   Clear structure: Presentation of the process - guided practice - use in tasks
–   Full explanations in textbooks: textual – visual - symbolic
–   Activation of learners

– Related information are presented together (divided attention effect)
– Numerous explicit examples of solutions (cf. [5]).

Although there is few data about it so far, the importance of the design of digital media for the learning success of students is often discussed among teachers and the scientific community. But there is just a short tradition to use these results for inclusive education [3].

Furthermore the evidence based research about the design of learning materials show that the following conditions lead to successful inclusive learning: 1. Deliberate and meaningful use of differential instructional materials, 2. Encouragement and facilitation of active and student directed learning, 3. Mutually agreed and effective cooperation of regular and special education teachers and 4. The alignment of general classroom instruction and diagnostically founded, individually prescribed and intensive instruction in cases of special needs. The learner's self-direction is an accessory skill. Due to the fact that self-directed learning means a big challenge for persons with learning difficulties, their teachers have to pay special attention to train this skill [6].

So far, the research on evidence based design of learning materials for inclusive education focused classic teaching materials such as textbooks in particular. However, the here presented project takes moving images and digital into account, which are part of the everyday life of students, growing up nowadays.

As an example the education platform "Planet School" was used. It is a multimedia joint project of the public broadcaster west (WDR) and south (SWR). This platform offers media-based learning and teaching tools for teachers, students and all others, who are interested in education. But, not all parts of this homepage are directed towards students. First, the homepage provides teachers with material for preparing lessons. The focus are moving images. The WDR and SWR broadcast these movies. Those movies as well as multimedia and worksheets can be downloaded from the platform in various formats. Thus, offers different ways of use during the lessons. Many schools are using these offers in various subjects. "Planet School" is not specifically designed for inclusive education. But in 2013 they started to design offers according to the needs of students with special needs. A first research project (2013/2014) addressed the question: What design principles can be used to create materials for blended learning in inclusive education. In phase I data on contemporary forms of inclusive education from the media-didactical perspective of teachers and producers of the educational homepage "Planet School" was conducted.

The educational homepage "Planet School" by the public broadcasters WDR and SWR was used as an example, because the producers developed a blended learning content that was created according to the design standards developed in phase I. The main outcome of the first phase was the development of principles for designing inclusive teaching- and learning media.

The developed guidelines contain eight factors that are essential for the creation of inclusive learning contents with digital media. These include:

1. Text and language
2. Individualization and personalization
3. Same learning subjects

4. Respect for the complexity of lived-realities
5. Cooperative/collaborative learning
6. Activity-oriented instruction
7. Web accessibility and universal design
8. General design principles

On that basis, the WDR created directives and checklists for the design of inclusive teaching- and learning materials specifically for the different types of media. Additionally, guidelines were developed which describe individual measures more detailed. Thus, both instruments aim at quality assurance. These instruments are the working basis for everyone who is involved in a new production [7]. According to these directives and checklists a first teaching unit was designed.

3   Method

Findings from phase I showed that complex language is one of the greatest barriers for inclusive learning. According to these findings, a further focus of this research are students with migration history.

This research project is supposed to generate universal findings for the development of movies, media and learning materials for inclusive education. Hattie concludes from his study: "If the teacher's lens can be changed to seeing learning through the eyes of students, this would be an excellent beginning" [4]. Following this idea, the perspectives of the students was central for the development of the research design.

3.1   Selection of Participants and Procedure

Using guidelines based on the findings of the first phase, the public broadcasting organization WDR produced four movies for use in geography lessons, as well as additional media and materials for inclusive education. Within the here described research we analyzed how individualized and personalized learning in inclusive education as exemplified by "Planet School" (www.planet-schule.de) can be successful. The focus is on the didactic and methodological implementation of these media for inclusive education.

For this project we chose a variety of schools to work with "Planet School" in inclusive education ("Hauptschule", "Gesamtschule", "Sekundarschule", "Förderschule"), because we wanted to know how successful the lessons are in different kind of schools. Five schools and eight classes with a range of heterogeneity were part of the second phase of the study. They worked at the beginning of the school year 2016/2017 in geography lessons on the topic "City, countryside, river". All schools are experienced in teaching students with special needs. In all classes, there was a great variety of students body, including students with various special needs, such as learning, language and communication, learning difficulties, physical-motor development and social-emotional development as well as German as a second language. The total sample involves 160 students as well as eight teachers with different professional background. Usually, the teachers educate on their own, two classes have team teaching and in four out of eight classes an assistant teacher supports the teacher.

During this intervention the following question is examined: How successfully can students learn by using movies and other blended learning materials designed using guidelines for inclusive design?

The methodology follows the approach of systemic perspective triangulation [8]. Triangulation implies that one investigated object is looked at from different perspectives. In our project we conducted the perspectives of students as well as of teachers. These different perspectives are conducted with different methods. Next to perspective triangulation, a data triangulation [8] is applied. From different sources information is generated. Furthermore, data triangulation implies a combination of differing types of data [9]. The data triangulation should be linked to the perspective triangulation.

Four movies for this teaching unit were produced, according to guidelines for geography in grade 5 and 6:

1. Life in a village and in the city
   In this teaching unit the students learn difference between life in a village and in the city. They learn what impact a different infrastructure has on everyday life. The students compare the living situations of the protagonists in the movie to their own. Based on this comparison, they form an opinion on where they would prefer to live.
2. From village to city
   This teaching unit deals with the spatial structure of cities and villages. While working with the movie, one key element of this teaching unit is the work with maps. The movie is built upon the movie "Life in a village and in the city" in terms of its content.
3. Leisure time and tourism
   In this teaching unit the students perceive that certain location factors and structural conditions shape leisure- and vacationing behavior. Additionally, they deal with occupations in the tourism- and leisure time sector.
4. The change of landscapes
   As a special form of land usage, the students get to know brown coal mining, as a special form of land usage. At the same time, the students reflect the situation of the residents as well as the effects on the landscaping.

Each movie exists in two versions, with and without animation. Five classes watched movie 1, four classes movie 2, five classes movie 3 and six classes movie 4. Six of the 20 movies were watched without animation.

3.2 Survey Instruments

The main approach is the evaluation of contributions to the geography series "City, countryside, river". The evaluation takes the form of a final assessment of the quality of the learning unit.

In our data analysis we referred to:

Flash Feedback
Flash feedback is a data collection method, which is also often used as a method for reflection in lessons [10]. Directly after watching the movie, the teachers conducted a

short flash feedback with their students. During the flash feedback, the students express their opinions on the movies freely. These free expressions were written down directly or from memory. This method allows to gather impressions directly after watching the movie. Totally, 20 of these flash feedbacks were conducted.

Quantitative Survey with Students

The questionnaire consists of closed questions with a six-point Likert scale. The even number of answer options is supposed to force the students to make clear choices. Additionally, this corresponds to the German grading system from one to six and therefore is already known by the students. These quantitative surveys were conducted by the teachers. They were able to react immediately to contradicting statements and had the opportunity to clarify these. The questionnaire covers the following subjects: evaluation of the movies, evaluation of the language, especially the comprehensibility, evaluation of the animations, evaluation of the protagonists and evaluation of the imagery. These aspects were also covered during the group interviews. The collected data was entered in SPSS and analyzed quantitatively.

Participatory Observations in Lessons

In order to conduct characteristics of students, teachers and lessons which affect the development of expertise and social, personal competences of the students a systematic participatory observation of the lessons was conducted. During the participatory observation we focused on individual learning processes and group processes. Chosen students were particularly observed [11]. In close consultation with the teachers one top-performing child, one child performing on an average level, one weaker student, and one child with German as a second language as well as two children with different special needs were selected. Due to the aspiration that the movies and materials are supposed to meet the challenges of students with heterogeneous needs, these students were particularly observed.

This collects data in terms of categories previously defined on conceptual grounds and refined in pilot work. (…) Criticisms of systematic observation have usually centered on validity issues (e.g., Delamont and Hamilton 1986), but it can be a useful research tool when answering specific research questions for which data are needed on relatively easily observed [11].

As main categories for the participatory observation served: methodology and didactic/differentiation, Design of material/reaction to material, design of the movie/reaction to the movie, comprehensibility of language and text, motivation, increase of expertise and collaborative work.

Group Interviews with Students

The group interviews with students were conducted with one top-performing child, one child performing on an average level, one weaker student, and one child with German as a second language as well as two children with different special needs. This was done in order to receive feedback from a variety of students and to conduct their specific needs. These interviews were conducted directly after a participatory observation.

During the interview the following topics were covered: Evaluation of the movies, evaluation of explanations and language, Interesting aspects, ability to focus on the

movie, evaluation of the protagonists, evaluation of the animations, evaluation of the learning effect and evaluation of the materials.

Group Discussion with Teachers

Design and reception of the movies	Total Evaluation, concentration / attention, reference to the lifeworld, learning effect/ increasing competences, activation of previous knowledge, clarity and reduction to the essential, imagery and image quality, evaluation of the protagonists, evaluation of animations total, evaluation of animations in relation to the learning contents, correlation movie + material, suggestions for improvement
Design and use of the material	Total evaluation, example solutions, structure, explanatory definitions, photo which are content related, meaningful application of pictograms, clarity, activation of previous knowledge, reference to the lifeworld, reduction to the essential, suggestions for improvement
Didactic	Useful information for teachers, feedback, design of the instruction, reference to curricula, differentiation of learning objectives
Methodology and teaching structure	Learning effect, independent selection of tasks, concentration/ attention, motivation, (informal) testing, conclusion at the end of the learning sequence, recurring structure, comprehensibility, mixed tasks, activity orientation, peer-based work, differentiation levels
Accessibility	Clear labeling of the files, reduction of stimuli visualization of contents
Access and comprehensibility of language and text	Language and text of the material, language in the movie, usability for students with German as a second language
Use of I-Pads (Additional category for I-Pad class)	

Fig. 1. Coding system with sub codes

In a final qualitative step, the quality of the movies and materials was discussed in a group discussion with teachers from all the schools involved. In addition, this was used to ensure that all aspects, which are relevant for the teachers, were covered.

The group discussion with teachers of all participating schools was based on an interview guideline, which covered the following topics: Experiences made while implementing the teaching unit "City, countryside, river, Evaluation of the teaching unit "City, countryside, river", Evaluation of the movies watched in this teaching unit, Evaluation of the materials offered by "Planet School", Assessment of the accessibility of the materials, especially text and language, Appropriateness of the methods and didactical advices, Suggestions for improvement for the accompanying materials, Evaluation of the learning effect due to this teaching unit.

Both, group interviews with students and group discussions with teachers were recorded and transcribed afterwards [12]. Next, using MaxQDA, the interviews and discussions were paraphrased and reduced. Finally, all interviews as well as the record of the participatory observation were analyzed using the qualitative content analysis by Mayring. In order to use the qualitative content analysis by Mayring, core categories were defined. This was done deductively, according to a prior theoretical analysis and inductively, using the conducted material.

This was done with the aim to reduce the material to its main contents, which are still presenting the basic material [13] (Fig. 1).

This procedure interlocks qualitative and quantitative analysis methods. Thus, we get findings going beyond those individual cases, but still considering the specifics of the respective source of data.

4   Results

The four existing movies and corresponding materials were tested by the eight participating classes.

Based on these tests, an understanding of the quality of the media was achieved. In addition, helpful didactic concepts, methods and learning conditions were devised. Because the analysis and interpretation of these complex data is not finished yet, first descriptive findings of the quantitative survey will be outlined. As far as possible those are linked to the group interviews, flash feedbacks and participatory observation. At the HCI in Vancouver the final results will be presented.

4.1   Perspectives of Students and Teachers

This study focused on the perspective of students. In total, three research tools were used to conduct their perspectives. In order to analyze the group discussion with teachers the same category system as for the analysis of the group interviews with students, flash feedbacks and participatory observation was used. First findings from the 95-minute group discussion with teachers supplement the perspective of the students. The further analysis will provide more detailed findings regarding the learning materials and methodical-didactical aspects. These will be presented at the HCI conference.

Evaluation of the Movies

Approximately 65% of the students grade the movies as very good or good. The first two movies were the highest-ranked ones. The reason might be, that these two movies were produced completely new for inclusive education, whereas for the production of the movies three and four also archive materials were used (Table 1).

Table 1. How did you like the movie? Grade the movie.

		Frequency	Percent	Valid percent
Valid	Very good	107	31,7	33,8
	Good	114	33,7	36,0
	Satisfying	55	16,3	17,4
	Sufficient	24	7,1	7,6
	Inadequate	9	2,7	2,8
	Unsatisfactory	8	2,4	2,5
	Total	317	93,8	100,0
Missing	0	21	6,2	
Total		338	100,0	

"I liked the movie that much, that I give a thumps-up, because such movies should be produced more often." (Group interview S)

"I think these movies are well done and should stay that way. They should not be more thrilling. Students are supposed to learn, instead of having nightmares." (Group interview KK)

The group interviews with students show the reasons for the positive valuation: The students characterize the movies as thrilling and funny. They are fun, interesting and are well produced. Also the flash feedbacks confirm this valuation. The analysis of the flash feedbacks confirm these findings. The majority of the valuation of the movies are positive. Many students were able to remember and to reproduce the contents of the movies. Many students think that the contents are explained well in the movie. "Fun and learning in combination" (Flash feedback, movie 3, class 5a).

First results of the group discussion with the teachers show a mainly positive evaluation, too. The teachers stress the demanding character of the movies and the good mixture between documentary and fiction. A typical statement from the teacher discussion was: "But altogether the materials were nice and I had fun." (Flash Feedback KK).

Accessibility of the Language

Overall, the students consider the comprehensibility of the language in the movies very positively. Also the question regarding the comprehensibility on the word-level was evaluated very positive. 78, 7% graded the comprehensibility of the words as very good or good. The results of the group interviews show: They were able to listen well. A comprehensible language with a good speech rate and clear pronunciation was used. The given explanations were described as good because they contributed to a better understanding. Despite the mostly positive valuation there are also negative valuations: speech too fast, hardly understandable, speech too loud, speech too quiet, outdated

language, drafted language, too much speech, too many explanations, unknown words, difficult for students with German as a second language (Table 2).

Table 2. The spoken words were easy to understand. The spoken words were hard to understand.

		Frequency	Percent	Valid percent
Valid	Very good	204	600	61,6
	Good	62	18,3	18,7
	Satisfying	46	13,6	13,9
	Sufficient	10	3,0	3,0
	Inadequate	3	,9	,9
	Unsatisfactory	6	1,8	1,8
	Total	331	97,9	100,0
Missing	0	7	2,1	
Total		338	100,0	

In the categories "Access and comprehensibility of language and text" the teachers considered positive the appropriate language level, although for students with special needs partly too complex. They praised that due to the movie-related support the students were able to understand relations from context, a better understanding due to repeated everyday life conversations as well as few questions and positive feedbacks by the students.

Animation
Mainly, the animations were evaluated positively. However, these evaluations differ widely between the different classes. Only 37, 6% answered the question how well the animations helped them to understand the topic with good or very good. The results of the group discussion regarding the animations do not correlate to those of the quantitative survey. On the one hand, the students say that the animations were cool, funny, cute, exciting, should last longer, reproduce the content of the movie, extend the movie, diversifies the movies and highlight particular animations. On the other hand students

Table 3. The animations were interesting and funny. The animations were uninteresting and not funny.

		Frequency	Percent	Valid percent
Valid	Very good	108	32,0	43,9
	Good	48	14,2	19,5
	Satisfying	36	10,7	14,6
	Sufficient	16	4,7	6,5
	Inadequate	10	3,0	4,1
	Unsatisfactory	28	8,3	11,4
	Total	246	72,8	100,0
Missing	0	92	27,2	
Total		338	100,0	

express negative evaluations because of the following reasons: waste of time, too childish, inappropriate timing, disturb their concentration, are too long, because of they forgot some of the contents, distract, disturb, strange sounds, should be talking, are not related to the content/topic (Table 3).

In a purely quantitative analysis of the group interviews, the negative statements regarding the animations are predominate. Using the analysis of the flash feedback as an additional source of data, it becomes clear, that the movies with animations obtain a better evaluation as those without. But also in the flash feedbacks, the evaluation is not exclusively positive.

The evaluation of the use of animations by the teachers is rather different. It is considered very good. They emphasize the positive reactions of the students and that the students were able to remember the contents and identify themselves with the animations.

Overall, the animations are regarded ambivalent.

Manageable Number of Protagonists

The quantitative data shows, that the students can empathize with the respective protagonists. The data of the interviews with students stresses the mainly positive identification. Especially the protagonists and their acting performance was valuated as very good or good (Table 4).

Table 4. I can well imagine the life of the adolescents. I could not imagine the life of the adolescents.

		Frequency	Percent	Valid percent
Valid	Very good	174	51,5	53,2
	Good	67	19,8	20,5
	Satisfying	57	16,9	17,4
	Sufficient	19	5,6	5,8
	Inadequate	1	,3	,3
	Unsatisfactory	9	2,7	2,8
	Total	327	96,7	100,0
Missing	0	11	3,3	
Total		338	100,0	

The teachers in accordance with the students highlighted positively the protagonists. In particular, the male protagonist of episode one was considered appealing because of his demeanor and attitude. He offered a high identification potential. His methods to guide through the movie raised the attention. The everyday communication of the protagonists are linked to the children's realities. The first movie included a lot of everyday conversations, while the fourth movie included long monologues, which is less exciting for the students.

5   Discussion and Conclusion

The starting point for this study was the question how movies and other blended learning materials are used for blended learning in inclusive classrooms and which conditions lead to successful learning and teaching. Additionally, data on effective learning [4] and findings of research on evidence-based design of learning materials for inclusive education, which hitherto focused on traditional teaching and learning materials [5, 14] build the frame for this research. In Wember's scholastic learning model, which is oriented towards prevention, he mentions four central conditions for the development of inclusive education. The first condition is deliberate and meaningful use of differential instructional materials [6]. The findings demonstrated that collaborative, lifeworld-related and product-oriented learning with media should be guiding principles for the design of movies and materials for inclusive classrooms [15]. Especially students with special needs can profit from the variability of digital teaching- and learning material. Within the scope of this research, we were able to identify what is important when implementing principles for designing inclusive digital teaching- and learning materials. Because of the triangulation we were able to conduct the needs of the students as well as of the teachers. In comparison to the first part of the project, the second part focusses more on the perspectives of the students.

It must, however, be critically stated that the participatory observation only provided a few additional findings. But it helped to understand and categorize the data generated with the other methods. Furthermore, this data cannot be generalized due to the small sample. Especially, for the type of school "Gymansium" no statements can be made, because despite intensive efforts we were not be able to win over a "Gymnasium" to participate in this study.

All things considered, it became apparent that movies are a suitable learning tool for all students and therefore, are also highly suitable for inclusive education. Not every movie is equally suitable (neither for all students). The criteria for the design of movies developed in the first phase of this research project (concentration on the essential and clear explanations, closeness to real life and motivating frame actions as well as no distracting elements - both formal- and content-related) were essentially confirmed. Blended Learning Platforms such as "Planet School" offer good foundations for inclusive learning and teaching:

- The multi-media platform offers different ways to absorb information,
- Multi-media complies with the media usage habits of students
- Movies are a central media in the life of students. Therefore, it is motivation for them, when movies are also used in schools.
- The media and materials allow the reduction of complexity
- Learning impulses for all students, regardless of their level of performance, due to suitable and vivid media
- The media internet provides good opportunities, to offer a variety of materials fully accessible

This example of inclusive teaching and learning with a blended learning platform show not only how media based education can enhance everybody's ability to learn, but

also that special education can be a key driver in proliferating media related learning. In order to accomplish the educational goals, the ideal approach to teaching and learning is to find the right balance between giving students the choice to meet their needs and preferences whilst maintaining a structured educational framework. Yet much more remains to be done going forward. Pedagogic change and a greater personalization of learning are both essential components for student centered, self-regulated, independent and inclusive learning [16].

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